

BROOKHAVEN NATIONAL LABORATORY NATIONAL SYNCHROTRON LIGHT SOURCE	Number: LS-SDL-0030	Revision: B
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Subject: DUV-FEL Operator Response to HPI Beam Loss and Chipmunk Radiation Monitors		
Prepared By: X.J. Wang	Reviewed By: A. Ackerman	Approved By: X.J. Wang

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DUV-FEL Operator Response to HPI Beam Loss and Chipmunk Radiation Monitors

Purpose

The purpose of these instructions is to provide DUV-FEL operating personnel with guidance for responding to radiation alarm levels caused by unusual conditions of beam loss. It is important that major beam losses be quickly evaluated and corrected.

Scope

This document applies to all DUV-FEL operations.

Background

There are two types of ionizing radiation monitors in use at the DUV-FEL; HPI beam loss monitors and Chipmunk area dosimetry monitors. The HPI's are used to identify beam loss points and are located within the accelerator enclosure. The Chipmunks are used to estimate personnel exposures and are located on the experimental floor. The Chipmunk locations are currently as follows:

- on top of control rack
- in the area between control rack and the Linac shield wall
- outside the undulator shield wall near the beam dump
- on top of the control console near the TLD area monitor.
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The data from the HPI beam loss monitors and Chipmunks are collected with dedicated computers and are displayed on separate video monitors.

Responsibilities

The on-duty DUV-FEL machine operator must monitor both the beam loss and Chipmunk radiation monitor signals through use of the computer system and audible alarm. The beam loss monitors are intended to provide immediate information to the machine operator about machine fault conditions. The Chipmunk monitors provide the machine operator with information about

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potential personnel exposures. **All abnormal conditions must be logged in the DUV-FEL Operations Log.**

It is the on-duty DUV-FEL machine operator's responsibility to use the Emergency Stop or laser shutter if radiation levels measure **> 20 mRem/hr at any Chipmunk monitor.**

It is the on-duty DUV-FEL machine operator's responsibility to monitor beam transport and to ensure that major faults (> 5 mRem/hr at any Chipmunk monitor**) are corrected within 5 minutes.**

The operator must always monitor the electron beam performance. Normal operation very often requires insertion of electron beam position monitors at various places along the length of the linac, beamline and undulator. This activity monitors the presence or absence of beam very closely. When no beam monitors are inserted into the electron beam path, the beam is continually monitored on the beam dump Faraday cup. This signal is prominently displayed at the operator console.

The operator must respond according to instructions below:

Indication of Electron Beam Loss. Response to signals from the HPI beam loss monitors:

- 1) The sequence for responding to abnormal (> 2.5 mrem/hr losses seen by the chipmunks, or large beam loss indicated by the HPI). Stop operations and consult the readout of the beam loss monitors to determine approximately where the loss is occurring.
- 2) Investigate abnormal equipment setpoints or readbacks by comparing the present equipment status with the required status in the file that was last loaded, concentrating on equipment located at or near the area of the accelerator determined in step 1.
- 3) If abnormality is noted, reduce accelerator repetition rate to 1 Hz and if necessary reduce gun laser intensity to reduce photocurrent, correct the abnormality and return to normal operating

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settings. If the operating conditions and radiation levels return to normal, resume former operating conditions. Record conditions encountered and steps taken in DUV-FEL operator log.

4) If no abnormality in equipment is observed (the most likely scenario), turn system to as low intensity as possible and start beam. The operator must now draw on his experience and training to determine the problem. Usually some retuning is required; temperature or line voltage fluctuations cause systems to drift and adjustment of one or often more parameters may be necessary. Using the beam monitors available, the normal operating conditions can be quickly restored by an experienced operator. Record conditions encountered and steps taken in DUV-FEL operator log.

5) If no cause for enhanced radiation levels or unusual beam loss condition is found, terminate operations and consult other technical staff and/or accelerator engineers/physicists to initiate further investigations. Record conditions encountered and steps taken in DUV-FEL operator log.

6) All tuning, set up or parameter changes of the electron beam must be done at lowest possible beam current and repetition rate in accordance with established principles of ALARA.

Indication of potential personnel exposure.

Response to Chipmunk Radiation Monitors located in personnel occupied areas:

Should the Chipmunk data display indicate that any Chipmunk monitor has moved into the yellow range, the Machine Operator shall stop operations and assure that personnel are moved away from the effected area. The area monitors are unlikely to provide readings beyond a few millirem/hr even during major beam loss scenarios. Any indication of area radiation levels advancing into the yellow or red alarm mode (see above) should be interpreted as a major beam loss and treated as described above.

Chipmunk personnel monitors are equipped with audible signals and flashing lights to indicate radiation level ranges. The Chipmunk colored lights indicate the following radiation levels:

< 2.5 mRem/hr	Green
> 2.5 and < 20 mRem/hr	Yellow
> 20 mRem/hr	Red

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Revision Log Table

Revision Number	Date Approved	Pages Affected	Description of Revision
A	7/15/03		original
Revision Number	Date Approved	Pages Affected	Description of Revision
B	8/12/04	1,3	Remove unnecessary text